THE MULTIPLEX WRITING MACHINE

Special Mathematical Model

Two complete sets on one machine,—of any Science or Language, or many correspondence faces. All printable on one machine. "Many typewriters in one." "Just Turn the Knob."

Sample Problem

To solve $\frac{\partial^2\varphi}{\partial t^2} = \sqrt{1+(\Delta h)^2}\,\frac{\partial^2\varphi}{\partial x^2}$, put $m^2 = \sqrt{1+(\Delta h)^2}$ and assume $\varphi = \tau(t)\cdot\xi(x)$; so that $\frac{\partial^2\varphi}{\partial t^2} = \frac{d^2\tau}{dt^2}\cdot\xi(x)$, and $\frac{\partial^2\varphi}{\partial x^2} = \tau(t)\,\frac{d^2\xi}{dx^2}$. Substituting these into the original equation, we find that the variables, t and x, can be separated by dividing through by $\tau\cdot\xi$ whereupon we have $\frac{d^2\tau}{dt^2}\div\tau = m^2\frac{d^2\xi}{dx^2}\div\xi$. Since the first of these two equal members cannot vary when t changes nor the second when x changes, both must remain equal to some constant, say $-m^2n^2$. The two resulting equations yield the solutions

$$\xi = K_1\cdot\sin[nx+\beta_1], \qquad \tau = K_2\cdot\sin[mnt+\beta_2]$$

whence $\varphi = K_1K_2\mathrm{Sin}[nx+\beta_1]\ \sin[mnt+\beta_2]$

which we may then reduce to a more useful form :

$$\varphi = \sum_{n=0}^{n=\infty} A_n\ \sin[n(x\pm mt)+\delta_n].$$

An interesting fallacy results from applying the method of integration by parts, $\int u\cdot dv = uv-\int v\cdot du$, to a case where $u=1/x$ and $dv=dx$: we get

$$\int\frac{dx}{x} = \frac{1}{x}.\int dx - \int x\cdot[-1/x^2]$$

$$= \quad 1 \quad + \int dx/x \qquad \text{whence } 0=1\ !!$$

$$\int\frac{dx}{5+7x^2} = 1/5\int\frac{dx}{1+{}^7/_5x^2} = \frac{1}{5}\sqrt{{}^5/_7}\int\frac{\sqrt{{}^7/_5}\,dx}{1+[\sqrt{{}^7/_5}\,x]^2}$$

$$= \frac{1}{35}\ \arctan\ [\sqrt{{}^7/_5}\ \ x].$$